



California Division of Oil, Gas, & Geothermal Resources (DOGGR) Response to Aliso Canyon Gas Leak

**Pipeline and Hazardous Materials Safety Administration
Workshop on Well Integrity for Natural Gas Storage**

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Supervising Oil & Gas Engineer



Relief well #1 (background)

Relief Well #2 (foreground)



Agenda

- **Introduction**
- **Impact**
- **Surface well control attempts**
- **Control-Cement-Confirm**
- **Safety Review**
- **California Underground Gas Storage Regulations**
- **Path forward**



“Never waste a crisis.”

- Unnamed Official

Key Events

10/1/1953 - Well SS25 spud

2/25/1954 – SS25 completed as oil well

6/6/1973 - SS25 converted to gas storage

- **Annual temperature and noise logs**
- **2014 SoCalGas filed Storage Integrity Management Plan (SIMP) with CPUC**

10/23/2015 - Leak noted near SS25 wellhead

12/04/15 - Relief well #1 (P39A) spud

2/12/2016 - SS25 controlled from P39A

2/13-14/2016 - SS25 cemented

2/15-18/2016 - SS25 confirmed sealed



Impact

- Governor declares State of Emergency
- Federal, state, and local agencies
- Well control operations >\$50 MM
- Significant Community Impact
 - Relocation cost >\$500 MM
 - ~8,000 residents relocated
 - 2 Elementary schools closed
 - Community groups activated
- Environmental: released ~ 5 Bcf methane
- Legal
 - Litigation cost TBD
 - >25 Class action lawsuits



State & Local Agencies Responded

- **Governor Brown's State of Emergency**
- **Three orders by Supervisor of Oil and Gas (DOGGR)**
- **Other agency actions**
 - **Public Utilities Commission**
 - **Office of Emergency Services**
 - **Air Resource Board (CARB and SWCAQD)**
 - **Fire (County and City)**
 - **Public Health**
 - **OSHA**



Federal Agencies Responded

- **Federal action**
 - **Secretary of Energy visit**
 - **National Labs: LBNL, LLNL, Sandia, Brookhaven**
 - **Pipeline Hazardous Material Safety**
 - **Jet Propulsion Lab**



Participating Agencies



Emergency Regulations

- Governor's Emergency Proclamation
January 6, 2016
- Emergency Regulations mirrored
the Governor's proclamation,
February 5, 2016
- Provided a framework for the
proposed permanent rulemaking



Top Down Well Control

- **Seven top down well control attempts**
 - **Heavy barite mud**
 - **Lost circulation materials**
 - **Ball sealers**
 - **Steel balls**
 - **Golf balls**
 - **Woody plugging agents**
 - **Junk shots**
- **Successive attempts eroded opening**



CONTROL-CEMENT-CONFIRM

- **CONTROL:** Well was controlled within 5 minutes of intercept with mud
- **CEMENT:**
 - After 24 hours of stable pressures, cement from TD to perforations
 - After 24 hours of WOC, cement from perforations to up to ~6,500 feet
 - After 24 hours, plug back relief well
- **CONFIRM:**
 - Shot fluid level – no change in 60 minutes
 - Temperature and noise log – no unexplained anomalies & TOC tubing = 8199' MD
 - Cement bond log - annular TOC = 7610' MD
 - Positive pressure test, held 900 psi for 70 minutes, loss = 0.75%



Heat Shields and Bridge



Safety Review General & Battery 1

- 114 gas storage injection and withdrawal wells
- 100% noise and temperature logs
- Transparency – DOGGR website
 - News releases
 - Safety Testing and Review Requirements
 - Test Results of Aliso Canyon Wells
 - Emergency Orders and Regulations
 - Maps, every log used, reports
- Decision point
 - Plug and abandon permanently or
 - Plug in tubing and fluid in tubing and annulus < 12 months or
 - Conduct full suite of tests to return to injection and withdrawal



Safety Review Battery 2 & Resumption

- **All injection and withdrawal wells**
 - Casing inspection (HRVRT and USIT) and caliper log
 - Cement bond log
 - Positive pressure test
- **SoCalGas may resume injection**
 - All wells either P&A'd, isolated from the reservoir, or passed all tests
 - After public workshop and comment period
 - Upon authorization by State Oil and Gas Supervisor
 - With approval of the California Public Service Commission
 - Tubing only production, with minimal pressure on isolated annulus
- **Potentially September 2016 with 20+ wells**



Proposed Regulations

- Approval Process
- Required Data
 - Risk Management Plans
 - Emergency Response Plans
 - Geology and Engineering
 - Casing Diagrams
 - Leak Detection Protocols
- Well Construction Standards
- Mechanical Integrity Testing
- Monitoring
- Inspections



Risk Management Plans

Identify potential threats and hazards

- Ongoing verification of well mechanical integrity
- Corrosion monitoring and evaluation
- Protocols for evaluation of wells and facilities
- Ongoing verification of reservoir integrity
- Evaluation of geologic hazards and natural disaster threats
- Prioritization of risk mitigations efforts



Well Construction

The operator shall ensure that a single point of failure does not pose an immediate threat of loss of control of fluids and to make certain that integrity concerns with a gas storage well are identified and addressed before they can become a threat to life, health, property, or natural resources.



Path Forward

- Improved interagency coordination with PHMSA, national labs, CPUC, CARB, etc.
- Protecting Our Infrastructure of Pipelines and Enhancing Safety (PIPES) Act of 2016
- California Legislation
 - SB 380 Natural gas storage
 - SB 887 Natural gas storage wells
- Lessons learned applied at a PG&E gas storage facility

Upcoming Workshops

- **Northern California**

August 9, 2016

1:00 to 5:00 PM

Natural Resources Building Auditorium

1416 Ninth Street, Sacramento, CA 95814

- **Southern California**

August 11, 2016

1:00 to 5:00 PM

Hilton Woodland Hills

6360 Canoga Ave, Woodland Hills, CA 91367

Thank You.

<http://www.conservation.ca.gov/dog/Pages/AlisoCanyon.aspx>

